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What Your Body Knows About God: How We Are Designed to Connect, Serve and Thrive

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PRAYER—THIS IS YOUR BRAIN ON GOD

Expecting parents love nothing more than attending their baby’s first ultrasound. There before them, on a simple black-and-white screen, science provides a sneak peek at their long-desired child. The white curve of a backbone with a tiny rib cage. A silhouette of a face marked by mother’s nose or father’s chin. And a four-chambered heart, beating strong and steady. “It’s the only time I’ll ever be able to see inside your head,” quipped one expectant father to his daughter, warmly cocooned in her mother’s womb.

We’re fascinated at this intimate look inside another person, the opportunity to see beyond the externals to the inner workings of the body. Because a person is more than just olive skin or blue eyes or slender fingers. It’s what’s inside that counts.

We can often be tempted to think of our spiritual lives as something external—a collection of things we do: church attendance, Bible reading, prayer, service. Or it is a set of beliefs that we hold. However, our relationship with God is profoundly connected to what is happening inside of us, in our bodies. Experiences of God, ranging from typical feelings of devotion while
singing praises to God to the ultimate transcendent union with God, have an impact on the rest of our bodies. These experiences can affect everything from our health to our relationships.

The brain plays a leading role in these spiritual encounters with God. Certainly our relationship with God is much more than a matter of brain waves, but it *includes* brain activity. Here a distinction must be made. The brain is the physical material that scientists can observe. It is the collection of neurons firing back and forth, the chemicals that lubricate those cellular interactions, and the blood flowing to keep it all working. In contrast, the mind is what can't be seen on an MRI or through any other tool of science. The mind is the collection of thoughts and feelings carried by those cells and chemicals. It is our sense of meaning and purpose, our desires and rationalizations. The brain is like the apparatus upon which the mind works.

It must not be thought, however, that the brain and mind are like a computer's hardware and software, as though they could be separated by a computer whiz. On the contrary, the Bible seems to talk about people not as separable parts but as whole beings, with each part affecting other parts. That's what the latest research is showing too. It is as though the hardware of the brain can rewrite the software of the mind. Our behaviors and our actions can change the nature of our brain, which can change the content of our thoughts. At the same time, our very thoughts can cause the neurons in our brain to grow and change.

Through cutting-edge research, as we look inside the brain at work we can catch a sneak peek into God's design of our bodies to commune with him. In doing so we can understand more fully how we connect with God and the ways in which we can grow in our spiritual lives.
An Inside Peek

Using the latest brain-imaging technology available, Andrew Newberg, a leading neuroscientist at Thomas Jefferson University Hospital and Medical College in Pennsylvania and professor of religious studies at the University of Pennsylvania, has extensively studied the brain and spiritual experience. The brain, says Newberg, is an intricate system that is “uniquely constructed to perceive and generate spiritual realities.”

What would we then see if we could peek in on our brains while praying or meditating on God? The nervous system is a web, running from the brain down through the spinal cord and out to every inch of the body. Its two basic states, “fight or flight” (sympathetic) and “relaxation” (parasympathetic), are responsible for different automatic body processes, like digestion, blood pressure and sweat. Prayer normally tends to enhance the relaxation response, which is why it reduces stress and lowers blood pressure.

However, in intense prayer or in communal worship, both systems can be active at once. “Generally speaking, it is rare that an experience both arouses and calms,” says Newberg, “which is one of the reasons why we think spiritual experience stimulates the brain in a unique way.” For example, worship can be loud and exciting while also creating a sense of inner peace. Or it may be intellectually stimulating while being relaxing, not taxing. The more that the two systems are simultaneously engaged, the more profound the experience. And when this spiritual circuit is fully engaged, we can experience a feeling of union with God and often with other people as well. In these moments, Newberg says, it is as though “the boundaries between you and God dissolve.” And you experience union with God.

In prayer there are other brain systems at work, because spiritu-
ality draws on every part of who we are. Our frontal lobe is rationally thinking about the experience, understanding it in terms of theology and application. The limbic system helps to provide an emotional flavor to the experience. At the same time, the amygdala, which is often the center of our experiences of fear and anger, might be soothed or calmed. Our anterior cingulate would help to translate these thoughts and emotions into compassion and empathy toward other people.

These structures of the brain are highly active during a spiritual experience. While the brain is engaged in an unusual way, it also seems to be functioning normally. Some have argued that spirituality is a hallucination or caused by epilepsy. But unlike those dysfunctions, spirituality seems to enhance the brain's capacity in a number of ways, it has healthful effects on the rest of the body, and it is personally meaningful.

Within the structures of the brain run chemicals that play vital roles in spiritual experiences like prayer. The neurons of the brain communicate through neurotransmitters, chemicals that send messages across the synapse (gap) between two cells. Even these chemicals are part of our spiritual experience and play an important role in our body's ability to connect with God. For example, researchers have found that the neurotransmitter serotonin is typically released during intense spiritual experience. Serotonin is produced by nerve cells in the brain as well as in the gut. The amount of serotonin in your brain can elevate your mood as well as affect memory, learning, sleep and vision. A healthy level of serotonin and you're happy as a clam. Low levels of serotonin and your physician might recommend taking an antidepressant medication.

In one study, Dr. Franz Vollenweider, director of the Heffter Research Institute in Zurich, Switzerland, found that blocking sero-
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Serotonin in the brain caused his research subjects to struggle with having spiritual experiences. Individuals remarked that they could not experience God.7

Certainly the ability to have a spiritual experience cannot be isolated to a single brain chemical. There is no shortage of Christian saints who suffered depression—and probably low levels of serotonin—and yet were close to God. But research does indicate that neurotransmitters play an important role in how we experience God. And conversely, these studies may help us to better understand times when we feel God's absence. The "dark night of the soul" may be not simply a form of spiritual depression but a signal that the brain is changing. One researcher believes that spiritual experiences can be so powerful that they knock loose some of the brain's wiring, creating a sense of God's absence as the brain rewiresthe necessary parts to experience God. In these periods of life, we may know cognitively that God exists but find it hard to connect with him. Whether we suffer from chronic depression or have an occasional case of the blues, serotonin levels are diminished, and that can affect our spiritual lives.

More Than a Feeling

If the design of our brain can allow for the lows of doubt or depression, it also provides amazing capacity for powerfully intimate connections with God. Mario Beauregard, a neuroscientist at the University of Montreal, conducted brain scans of Carmelite nuns while they recalled their spiritual experiences and saw this occurring with startling regularity. In one experiment, he studied fifteen nuns during three separate brain states: resting, then while remembering an intense feeling of union with another human being, and finally as they recalled an experience of union with God.
We might expect that remembering these two kinds of emotional experiences would involve similar brain systems. Yet in Beauregard's research, remembering an experience of God proved to be unique. Beauregard found that the mystical state involved areas of the brain that orient the body in space. In remembering intimacy with God, the nuns' brains responded not simply with a feeling of relational connection but with a strong sense of union to something beyond themselves. Several of the women “mentioned that during the Mystical condition they felt the presence of God, His unconditional and infinite love, as well as plenitude and peace.”8 While both kinds of union involved strong feelings, spirituality was a unique experience in the brain.

Intense spiritual experiences cause the brain to work in ways that suggest spirituality is a specific capability of our brains. Beauregard says his studies confirm that spiritual experiences involve far more than the emotional parts of the brain, including “a variety of functions, such as self-consciousness, emotion, body representation, visual and motor imagery, and spiritual perception.”9

Finally, God has designed our brains with the ability to change, to be transformed. The apostle Paul exhorts believers to “be transformed by the renewing of your mind” (Rom 12:2). This isn't just a nice suggestion. Andrew Newberg and Mark Robert Waldman write, “Intense, long-term contemplation of God . . . appears to permanently change the structure of those parts of the brain that control our moods, give rise to our conscious notions of self, and shape our sensory perceptions of the world.”10 As our brains change—literally with neurons growing, adapting, knitting themselves together—the brain area that deals with anger becomes less active, and compassion for others grows.11 Our memory is enhanced, we become more motivated, and our baseline level of happiness increases. We become generally more joyful.
This improved neural functioning can help our general health. "Spiritual practices," says Newberg, "enhance the neural functioning of the brain in ways that improve physical and emotional health."12 As we regularly commune with God, we create the neural pathways that strengthen our relationship, eliminating those things that would detract from our growth and reinforcing and developing those habits that lead to our sanctification. This is how God designed us to thrive.

Practicing Prayer
Prayer can look like lots of different things. It can be chatty, meditative, stream of consciousness, or focused. But researchers tell us that the kind of prayer that changes our brains is a specific kind: deep prayer, or focused, attentive prayer. And many of us are not accustomed to this kind of prayer.

Prayer that changes us involves our full concentration. Fair warning: this sort of prayer often doesn’t come easily. Evelyn Underhill, a twentieth-century writer on Christian mysticism, considers how difficult attentive prayer can be. “The first quarter of an hour thus spent in attempted meditation will be, indeed, a time of warfare; which should at least convince you how unruly, how ill-educated is your attention, how miserably ineffective your will, how far away you are from the captaincy of your own soul.”13

This style of prayer is hard because so much of our life is built on distraction. To hear the “still small voice” of God, we need to quiet our minds. And if prayer is going to change us, we need to pay attention, close attention, to God and our own hearts.

Christian history provides us with many methods for attentive, focused prayer. Many Christians still practice the centuries-old method of the spiritual exercises or daily examen taught by Ignatius
of Loyola. Others find the contemplative prayer of the desert fathers and mothers and *lectio divina* from the Benedictines to be helpful methods of prayerful contemplation. Since the 1970s, centering prayer has also provided guidance to Christians looking to focus their hearts through prayer. These guides, and others, all call the Christian to quiet her mind, remove herself from the cares and noise of the day, and simply sit in God's presence.

In contrast, many Protestant methods are heavy on content, encouraging those in prayer to use the skills often used in classrooms or Bible study. While we ought to be filling our minds with biblical teaching, learning to listen to God requires that we be still and, sometimes, stop talking. For example, the ACTS pattern of prayer (adoration, confession, thanksgiving, supplication) can keep our minds too busy, at times preventing us from becoming quiet and attentive. It's a great pattern of prayer but may not be the best model for leading us into the kind of communion with God that we seek.

**Pray, Learn, Repeat**

If we are to pray in ways that shape our brains, we must be willing to practice. Because of my busy family and work life, it is always a challenge to find a time when I can avoid distraction for a full fifteen minutes. Of late, I have found that space as I sit in the dark in my children's bedroom after I tuck them in at night. While they lie quietly waiting for sleep to come, I set my timer and begin to pray. They like the companionship as they drift off to sleep; I appreciate the opportunity to practice quiet prayer. And when it's hard to calm the restlessness in my mind, the timer allows me to pray for a specific period without checking every few minutes to see how much time I have left.
Sitting with my back against the wall, I begin by quietly saying the name of Jesus. I pray in whispers, because it helps my concentration to be moving my lips and hearing my own prayer. Praying solely in my mind too easily allows me to become distracted.

After a few minutes of saying Jesus' name, I have "warmed up" and entered a prayerful mental posture, one that allows me to be filled with Scripture and truth. I then pray, again by repetition, phrases from the Psalms that I have learned through instruction or ones that I particularly like: "Bless the Lord, O my soul" or "God is my refuge and strength." Sometimes I repeat phrases from written prayers, such as "Come, Lord Jesus, draw me to yourself," and the Jesus Prayer, "Lord Jesus Christ, Son of God, have mercy on me." I often try to picture a biblical scene while I pray. I find this also helps my concentration.

As I sit in the quiet dark, I find I am easily distracted. Even while I am praying, my mind wanders elsewhere, thinking about what happened during the day, things I must do, or concerns I have. That's bound to happen, though, and I simply keep refocusing my attention.

Sometimes the buzz of the timer is a relief—focus has been difficult to find that night. Other times I am surprised that the time has passed so quickly. Once my timer goes off, I begin to pray for specific things. I find that my conversation with God about my hopes, worries and concerns is much livelier and spiritually sensitive after I have spent fifteen minutes in attentive prayer.

Other methods, such as lectio divina and praying through written prayers, have allowed me to expand the language of my prayer life. When I use lectio divina, I pray slowly and methodically over a short biblical passage. My intent isn't to study and understand the meaning of the text in an exegetical way, but simply to allow the inspired Word of God to speak. Memorizing written
prayers such those in the Book of Common Prayer also has allowed me to enter into a deeper and more focused prayer.

Thomas Merton wrote, “I pray better to You by walking than by talking.” His words resonate with me as a student of attentive prayer. During regular walks, I can repeat the Jesus Prayer or “Come, Lord Jesus.” I enter a rhythm in which my prayer, my breathing and my walking flow together. When I pray on a walk, I find that my mood shifts significantly even though my mind seems to take on a heightened awareness of the trees, the landscaping, or my direction. My attention to my prayer has caused a subconscious adjustment.

Effects like these extend to my children as well. Praying like this can dismantle a temper tantrum. It can help an energized child settle into bed and fall fast asleep. In our home, attentive prayer has ended sleepwalking sessions, calmed tears and fears, and soothed nightmares. While children may be less able to assert rational control over their moods, prayer offers them a tool to calm and settle the mind and an intimate access to relationship with God.

What I can witness in my children I know is also true of me. Focused, attentive prayer changes me and allows me to experience God in a way that other forms of worship cannot. It changes who I am at a deeper level than I can reach through direct, intentional efforts to try to be more compassionate or to let go of anger or jealousy. It enables me to follow the words of Scripture long after I have left the quiet fifteen minutes in my children’s bedroom.

**It’s Not All in Your Head**

When Paul encourages the Ephesians toward Christian living, he includes two powerful categories of change. His admonition to “be made new in the attitude of your minds” is quickly followed by a list of dos and don’ts for social relationships (Eph 4:23). He gives
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instructions on lying, stealing, gossip, generosity and forgiveness. Paul clearly saw that internal change comes hand in hand with external change. For Paul, and for neuroscientists who study brain activity today, the connection between what we think and what we do is a powerful one.

The brain activity of our spiritual life involves not only private piety but public concern as well. We are designed both to love God and to love our neighbor. From the habits of our minds to prayer to deep relationships and acts of service, we can take steps to become people who are in touch with God.

Researchers have found that spiritual activity, such as prayer, enhances our brain's ability to recognize the suffering of others and to respond in action. The areas of the brain involved in spirituality tend to strengthen those involved in compassion. Prayer, this research shows, helps us control feelings like anger and fear and helps us feel connected to other people. By praying with another person, or even for another person while alone, research shows that we can ease negative feelings and enhance our connection to that person.

The anterior cingulate is a backward-C-shaped brain structure that sits a few inches behind the forehead. This region is involved in regulating bodily activities like blood pressure and heart rate, but it is also involved in emotion, the expectation of rewards and empathy. Researchers have found this area of the brain is involved in prayer and meditation as well as compassion. Since neurons are like muscles—the more they work the stronger they are—exercising this area in prayer enhances a person's compassion.

Researchers compared the responses of expert meditators and novices to distressful sounds. When both groups were at rest or meditating, they found that the anterior cingulate and another brain region, the insula, were the most affected by these noises. They also
found that the longtime meditators responded more strongly, and those expert meditators who said "they had successfully entered into the meditative state" tended to respond most strongly.14

Other studies have confirmed and amplified these results, finding that within a relatively short amount of time a person's compassion can grow through meditation. Another study gave subjects thirty minutes of online meditation training for fourteen days. They split the subjects into two groups; one group practiced "compassion meditation" while the other control group engaged in "cognitive training." At the end of the fourteen days, subjects were asked whether they wanted to donate part of the money they received from participating in the study to charitable causes. The compassion meditators, especially those "who showed the biggest boost in activity in the insula," were more compassionate than those who participated in cognitive training. The insula is located near the center of each hemisphere of the brain, and part of its function is to regulate social emotions as well as mind and body interactions. The participants with a more active insula donated the most money.15

The fact that prayer and compassion are so interrelated in the brain helps us to understand the apostle John's assertion that as we love one another, "[God's] love is made complete in us" (1 Jn 4:11-12).

Neuroscience and the Soul

Our culture tends to reduce all things to matter, and more and more aspects of our lives are being "demystified" of the spiritual qualities they were once assumed to have. What in centuries past was a universe alive with God's Spirit we now see as driven by mechanical forces. If we see our own spiritual nature as the simple result of these biological forces, we become products of the mere
mechanics of the universe. Part of our challenge is to get past the only options our culture can envision, either of mechanical nature or of an external, supernatural spiritual force that is able to break the laws of nature. We find this struggle particularly true when we look at science and ask: Where is the soul? Do we have a soul?

The Bible's approach can help us get beyond this dichotomy. It doesn't seem much concerned about whether we are made of two parts (body and soul) or three (body, soul and spirit). Its original audiences and writers were more concerned with what a thing was for (its function), rather than what it was made of (its composition), says John Walton, an Old Testament professor at Wheaton College. He writes, "People in the ancient world [including the original readers and writers of the Old and New Testaments] believed that something existed not by virtue of its material properties, but by virtue of its having a function in an ordered system." As a result, we don't find in the Bible a list of ingredients for a human being, though we read many instructions for how a human being should act.

If we see the Bible's description of humanity through functions, things can become clearer. In the New Testament we see Greek words like sarx (body or flesh), nous (mind), pneuma (spirit), kardia (heart) and psyche (soul). These are not so much building blocks of who we are as things we do. We are people who will die and return to dust, so we are corruptible flesh waiting to put on incorruption (in Paul's words in 1 Cor 15:53). We are also animated by the breath of God (spirit), we think rationally (mind) and feel (heart), and we have a personhood (soul). These aren't puzzle pieces that can be pulled apart and fit back together. Instead, says N. T. Wright, "When Paul thinks of human beings he sees every angle of vision as contributing to the whole, and the whole from every angle of vision. All lead to the one, the one is seen in the all." It would seem that our
composition is more like a long-simmering jambalaya, where the flavors of the ingredients blend together, than a ham sandwich with the cheese slipping out from between the ham and bread.

This Is Your Brain on God

In 1987, the US antinarcotics group Partnership for a Drug Free America introduced what would become one of the most memorable commercials in television. Audiences saw an egg drop into a hot frying pan, heard the sizzle, and were told, "This is your brain on drugs. Any questions?"

The spot was memorable not only because it was an emotionally compelling piece but also because it confirmed a popular view that drugs can fry your brain. Nicole Dudukovic, a memory researcher in human biology at Stanford, recalls, "I didn't really understand how my brain would ever be anything remotely like a fried egg, but I certainly got the message that drugs weren't good for me."18

New research arrives yearly in scientific journals expanding and clarifying our understanding of this most fascinating organ. Explaining brain functioning is certainly a complex endeavor; exploring the interaction between our bodies and an unseen God is even more so.

The three parts of this book are designed to reveal more about these mysterious, wonderfully made bodies we inhabit. First, we will see how our bodies are spiritual, such as how eating or exercise or hospitality affects us. We will see how from birth we are primed to look for God and connect significantly with the people around us. We will also see how our bodies respond to the people around us throughout our lives, from casual observation to the intimacy of marriage. And we will consider what it means when our bodies malfunction. How do we think of God as Creator when the creation is broken?
Part two will explore how we change through spiritual practices. The spiritual disciplines are sometimes seen as a kind of magic: do this to make that happen. Actually, there are biological reasons that spiritual practices change who we are. Finally, in part three we will see how this all adds up to a fully engaged life, one that is physically healthy and personally meaningful. Because we are not simply individuals on a spiritual journey, we will also consider what Christians living in tune with God and loving their neighbors can offer in a world in which these deepest human needs are so often unmet.

To be sure, this endeavor is a complex one. Perhaps that’s why we find metaphors helpful. If your brain on drugs is like an egg in a frying pan, your brain on God is like a harpist playing a beautiful song. In physics, the most fundamental property in the universe is a one-dimensional vibrating string. As we engage in disciplines such as prayer, we tune our hearts to resonate with the Creator. Then just as a vibrating string causes other strings with the same frequency to also vibrate, neuron by neuron begins to respond, working in harmony to create new pathways, so that our brains resound in praise. And these sweet tones cannot help but resonate out to those around us. They ripple out in acts of love and service, the practical workings out of a faith that has begun in the infinitesimally small places of the brain.